

REMARKS

Claims 24-26 and 28-45 are currently pending. Claim 27 has been canceled without prejudice, and claim 25 has been amended. The Examiner's remarks in the Office Action are addressed below.

Objection to Drawings

Enclosed herewith please find drawings in accordance with 37 CFR 1.84(l).

Claim Rejections – 35 U.S.C. 112, second paragraph

The Examiner rejected claim 27 under 35 USC 112, second paragraph, as indefinite for failing to particularly point out and distinctly claim the subject matter which Applicant regards as the invention. Claim 27 has been canceled without prejudice, and accordingly the rejection of claim 27 is now moot.

Claim Rejections – 35 U.S.C. 112, first paragraph

The Examiner rejected claims 25-45 under 35 USC 112, first paragraph as failing to comply with the written description requirement. The applicant respectfully disagrees.

Amended independent claims 24 and 45 include, in part, "the temporal variation of the deposits be independently controlled by independently monitoring" and "continuously varying the rates of deposition of the components" of the deposit(s) to obtain continuous homogeneous temporal deposition of the composition on the substrate. This limitation is supported in the description, for example, on page 7, lines 14-16; page 9, lines 25-30; page 11, lines 2-7 and 23-25; and page 13, lines 15-21. For example, page 6 of the specification discloses that if the stoichiometry is not adequately controlled, then the phosphor material may form more than one crystal phase, meaning that the deposited film will not be homogeneous. On page 5, lines 27-30, the specification discloses that through controlling the first and second sources based on the monitored temporal variation in

deposition, a homogeneous temporal deposition of the composition can be obtained. Furthermore, example two in the specification (page 13) describes the deposition process and states that the relative rates of deposition need to be adjusted to account for the differences between the sticking coefficient of the two source materials on the rate monitors and the sticking coefficients for the combined materials on the substrate. In addition, on page 9, lines 11-15, the specification discloses that a "computer-based feedback system" can be used to control the "evaporation rate" of each of the source materials. To one skilled in the art, a "computer-based feedback system" can include a sensing element (e.g., a crystal rate monitor, page 9, line 12) providing measurements (i.e., an evaporation rate, page 11, lines 33-34) to a controller. The controller calculates and delivers an output to a control element (e.g., a heater for a source) based on a user desired setpoint (e.g., a setpoint based on stoichiometry). The controller then further monitors the sensing element to see if further adjustment is necessary. As such, the computer-based feedback system can continuously vary the rates of deposition to obtain continuous homogeneous temporal deposition of the composition on the substrate.

As to claim 45, the aspect of varying the rate of deposition of said components of at least one of said deposits is supported in the description at page 11, lines 33-34, which states that the method permits control of the relative rates of deposition from more than one source. As such this implies that the relative rate of deposition can be controlled from one source. Therefore, the specification does support the claimed subject matter, and accordingly the Section 112, first paragraph rejections of claims 25-45 should be withdrawn.

Claim Rejections – 35 U.S.C. 102(b)

The Examiner rejected claims 24-27, 33, 34, 37, 41, 42 and 45 under 35 U.S.C. 102(b) as being anticipated by U.S. 5,089,104. The Applicant respectfully disagrees.

The '104 patent discloses an apparatus having a plurality of ion beam sources or neutral beam sources which can be controlled independently (column 4, lines 13-17). Ion beams from the plurality of ion beam sources are projected to a plurality of targets (Abstract). Sputtered particles from the targets are directed at the substrate to form a multiple-element thin film (Abstract). During the film formation, the composition ratio of sputtered particles is measured by using the atomic absorption method in the vicinity to the substrate (column 3, lines 18-22).

The '104 patent does not teach or suggest directly monitoring "the rate deposition of said components ... onto said substrate." The rate of deposition is equal to the product of the concentration of the individual elements in the vapour phase and the average velocity of the species. The mass of the vapor species and the energy imparted to the species at their respective sources may cause the average velocity of the species to vary. Such variation is particularly noted when the deposition vapour pressure is sufficiently low. Due to such low vapour pressure, the mean free path for the vapour molecules is comparable to or greater than the distance between the source and deposition substrate. Such a condition is often met in vapour deposition processes. Velocity variation of the different species is of less concern for reactive sputtering systems commonly used to deposit oxide or nitride films, as disclosed in the '140 patent, due to the relatively high pressure used for reactive sputtering and concomitant short mean free path.

A simple measurement of the concentration of vapour species will not reliably determine the rate of deposition on the substrate because the sticking coefficient of the deposited species depends not only on the identity of the species but also the molecular form of the species. The spectrometer disclosed in the '140 patent is not capable of distinguishing individual atoms from molecular clusters of atoms because the spectrometer reduces everything to atomic form prior to analysis. An atomic absorption spectrometer determines individual concentration of atomic elements by monitoring an optical absorption line for each atomic element. For example, if Al_2S_3 and CaS are the two components used, then the concentrations measured by an apparatus of the '104 patent would be the

concentrations of aluminum, calcium, and sulfur instead of Al_2S_3 and CaS . This measured concentration may be inaccurate for the species of interest (i.e., Al_2S_3 and CaS) because it can include concentrations of elemental species, and/or compounds other than Al_2S_3 and CaS . Thus, the apparatus of the '104 patent could not determine a rate of deposition for each compound (even if a mean free path could be estimated). As a result, the deposited film may not be homogeneous, especially at low deposition pressures and when two or more molecular species contain common atomic species.

To summarize, the '104 patent does not teach or suggest each and every limitation of claims 24 and 45 (for example, monitoring the rates of deposition of the components onto the substrate). Accordingly, the Section 102 rejections of these claims should be withdrawn. Claims 25-27, 33, 37, 41, and 42 depend from claim 24, and accordingly, the Section 102 rejections of these claims should be withdrawn for the foregoing reasons and for the additional features of these dependent claims.

Claim Rejections of Claims 30, 31 and 38 – 35 U.S.C. 103(a)

The Examiner rejected claims 30, 31 and 38 under 35 U.S.C. 103(a) as being unpatentable over Kanda (U.S. 5,089,104) in view of Fuyama (U.S. 4,857,802). For the reasons discussed below, the cited references cannot support a *prima facie* case of obviousness with respect to these claims.

As discussed above, the '104 patent does not teach or suggest each and every limitation of claim 24, in particular, the step of independently monitoring the rates of deposition of each component and varying the rates of deposition of the components to provide homogeneous temporal deposition of the composition. The '802 patent was cited to teach sputtering a thin film EL element onto a substrate, and so does not fill the void identified above. As a result, the combined teachings of the '104 patent and the '802 patent do not teach or suggest each and every element of these claims. Accordingly, these references cannot support a *prima facie* case of obviousness with respect to claims

30, 31 and 38 for the foregoing reasons and for the additional features of these claims, and the Section 103 rejections of these claims should be withdrawn.

Claim Rejections of Claims 24-29, 32, 33, 35-37, 41, 42 and 45 – 35 U.S.C. 103(a)

Claims 24-29, 32, 33, 35-37, 41, 42 and 45 were rejected under 35 U.S.C. 103(a) as being unpatentable over Velthaus (U.S. 5,505,986) in view of the '104 patent. For the reasons discussed below, the cited references cannot support a *prima facie* case of obviousness with respect to these claims.

The '986 patent is directed to a deposition process, in which the selection of a substrate temperature during deposition is key to eliminate the need for subsequent annealing to form and crystallize the phosphor material. The deposition process is a multi-source process which permits the control of the individual temperatures and the fluxes of each of the deposition source material.

The combined teachings of the '104 patent and the '986 patent fail to teach or suggest at least one feature of claims 24-29, 32, 33, 35-37, 41, 42 and 45. For example, both the '104 and '986 patents fail to teach or suggest "independently monitoring and continuously varying the rates of deposition of said components ... to obtain continuous homogeneous temporal deposition of said composition." As described above, the '104 patent teaches measuring vapour composition using spectrometers instead of measuring rates of deposition using deposition rate monitors. The '986 patent discloses controlling individual flux of evaporated material but fails to teach or suggest that the flux can be continuously varied based on independently monitored rates of deposition. As such, the '986 patent teaches controlling individual fluxes in a feed forward fashion and fails to teach or suggest "independently monitoring and continuously varying the rates of deposition of said components." As a result, the combined teachings of the '104 and the '986 patents fail to teach or suggest at least one feature of the pending claims. Accordingly, these references cannot support a *prima facie* case of obviousness with respect to claims 24-29,

32, 33, 35-37, 41, 42 and 45 for the foregoing reasons, and the Section 103 rejections of these claims should be withdrawn.

Claim Rejections of Claims 30, 31 and 38 – 35 U.S.C. 103(a)

Claims 30, 31 and 38 were rejected under 35 U.S.C. 103(a) as being unpatentable over Velthaus (U.S. 5,505,986) in view of the '104 patent and further in view of the '802 patent. For the reasons discussed below, the cited references cannot support a *prima facie* case of obviousness with respect to these claims, as the combination of these references does not provide each and every element of these claims.

As discussed above, the combined teachings of the '986 and '104 patents fail to teach or suggest at least one feature of claim 24. The '802 patent was cited to teach sputtering a thin film EL element onto a substrate, and so does not fill the void identified above. Accordingly, these references cannot support a *prima facie* case of obviousness with respect to claims 30, 31, and 38 for at least the foregoing reasons and for the additional features of these claims. As a result, the Section 103 rejection of these claims should be withdrawn.

Claim Rejections of Claim 34 – 35 U.S.C. 103(a)

Claim 34 was rejected under 35 U.S.C. 103(a) as being unpatentable over Velthaus (U.S. 5,505,986) in view of the '104 patent and further in view of Wu (U.S. 5,432,015). For the reasons discussed below, the cited references cannot support a *prima facie* case of obviousness with respect to these claims.

As discussed above, the combined teachings of the '986 and '104 patents fail to teach or suggest at least one feature of claim 24. The '015 patent was cited to teach depositing a dielectric film, and so fails to fill the void identified above. Accordingly, these references cannot support a *prima facie* case of obviousness with respect to claim 34 for at

least the foregoing reasons and for the additional features of claim 34. As a result, the Section 103 rejection of claim 34 should be withdrawn.

Claim Rejections of Claims 39, 40, 43, and 44 – 35 U.S.C. 103(a)

Claims 39, 40, 43 and 44 were rejected under 35 U.S.C. 103(a) as being unpatentable over Velthaus (U.S. 5,505,986) in view of the '104 patent and further in view of the '802 patent and the '015 patent. For the reasons discussed below, the cited references cannot support a *prima facie* case of obviousness with respect to these claims.

As discussed above, the combined teachings of the '986, the '104, and the '802 patents fail to teach or suggest at least one feature of claim 24. The '015 patent was cited for disclosing depositing a dielectric film, and so fails to fill the void identified above with respect to the '986, '104, and '802 patents. Accordingly, these references cannot support a *prima facie* case of obviousness with respect to claims 39, 40, 43 and 44 for at least the foregoing reasons and for the additional features of these claims. As a result, the Section 103 rejection of claims 39, 40, 43 and 44 should be withdrawn.

Claim Rejections of Claims 24, 28, 29, 32, 33, 35-37 and 39-45 – 35 U.S.C. 103(a)

Claims 24, 28, 29, 32, 33, 35-37 and 39-45 were rejected under 35 U.S.C. 103(a) as being unpatentable over Velthaus (U.S. 5,505,986) in view of Shimoyama (U.S. 5,372,837). For the reasons discussed below, the cited references cannot support a *prima facie* case of obviousness with respect to these claims.

The '837 patent discloses a deposition apparatus having a sensor for sampling an evaporation speed of evaporated sources only for at a specified moment in a time period. The '837 patent discloses that if the rate of deposition is continuously monitored, the lifetime of the deposition rate sensor would expire before a deposition process is completed. To solve this problem, the '837 patent teaches placing a shutter in front of the deposition rate monitors such that the monitor can only be turned on at specified moment

and only for a short period of time. In addition, the evaporation rate is only varied when the monitor is turned on. As a result, the lifetime of the monitor can be prolonged.

There is no motivation or suggestion to combine the teachings of the '986 and the '837 patents. In fact, the '837 patent teaches away from "continuously varying the rates of deposition" of claim 24. The '837 patent teaches that an apparatus that continuously monitors deposition rates is potentially inoperable because the deposition rate monitor would expire before a deposition operation can be completed. The '837 patent further teaches that only by intermittently monitoring and varying the rates of deposition, the apparatus may perform satisfactorily. As a result, one skilled in the art would not be motivated to combine the teachings of the '986 and the '837 patents. Accordingly, these references cannot support a *prima facie* case of obviousness with respect to claim 24. Claims 28, 29, 32, 33, 35-37 and 39-45 depend from claim 24, and so the Section 103 rejections of these claims should be withdrawn for the foregoing reasons and for the additional features of these claims.

Claim Rejections of Claims 25-27 – 35 U.S.C. 103(a)

Finally, claims 25-27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Velthaus (U.S. 5,505,986) in view of the '837 patent and further in view of the '857 patent. For the reasons discussed below, the cited references cannot support a *prima facie* case of obviousness with respect to these claims.

Claim 25, as amended, depends from claim 24 and includes (in addition to the features of claim 24) the additional feature that the temporal variation is obtained by monitoring the rate of deposition from the first source with a first coating rate monitor and monitoring the rate of deposition from the second source with a second coating rate monitor. The first coating rate monitor is shielded from deposition from the second source, and the second coating rate monitor is shielded from deposition from the first source. The

first and second coating rate monitors are placed outside the first and second sources and proximate to the substrate.

There is no motivation or suggestion to combine the teachings of the '986, the '837, and the '857 patents. As discussed above, there is no motivation to combine the teachings of the '986 and '837 patents because the '837 patent teaches away from "continuously varying the rates of deposition." The '857 patent also teaches away from "continuously varying the rates of deposition of said components ... to obtain continuous homogeneous temporal deposition" of claim 25. Instead, the '857 patent teaches metering out pulses of evaporant from the sources sequentially so as to form a laminated film with a composition that is heterogeneous on an atomic scale. As such, the '857 patent also fails to provide a suggestion or motivation to combine.

In addition, claim 25, as amended, includes the first and second coating rate monitors that are (1) shielded from the other sources, (2) placed outside the first and second sources, and (3) proximate to the substrate. None of the cited references teaches this combination feature nor provides any motivation for modifying the locations of the coating rate monitors. Accordingly, these references cannot support a *prima facie* case of obviousness with respect to claim 25, and the Section 103 rejection of claim 25 should be withdrawn. Claim 26 depends from claim 25. Thus, the Section 103 rejection of claim 26 should be withdrawn for the reasons discussed above and for the additional features of this claim. Claim 27 has been canceled. Accordingly, the Section 103 rejection of claim 27 is now moot.

Conclusion

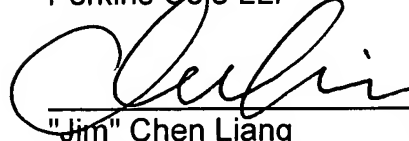
In view of the foregoing, the claims pending in this application comply with the requirements of 35 U.S.C. § 112 and patentably define over the applied references. A Notice of Allowance is, therefore, respectfully requested. If the Examiner has any questions or believes a telephone conference would expedite prosecution of this

application, the Examiner is encouraged to call the undersigned representative at (206) 359-6038.

Respectfully submitted,

Perkins Coie LLP

Date: 11/26/06


"Jim" Chen Liang
Registration No. 51,945

Correspondence Address:

Customer No. 25096

Perkins Coie LLP

P.O. Box 1247

Seattle, Washington 98111-1247

(206) 359-8000